

# Dynamic Stability Characterization of Rigid Deployable Aerodynamic Decelerators

Completed Technology Project (2011 - 2015)



## Project Introduction

The objective of the proposed research is to identify stable configurations of a rigid deployable aerodynamic decelerator for Mars atmospheric entry which provide increased landed mass capabilities for planetary exploration. Rigid deployable aerodynamic decelerators are a proposed means of augmenting the drag performance of atmospheric entry vehicles without adding significant mass to the system. The development of such a technology would allow for bridging of the gap between the robotic missions which we have successfully landed on Mars to date and the potential human class missions. This objective will be accomplished by performing a systems level architecture assessment to identify potential candidate configurations with the desired performance, dynamic scaling and estimating the expected stability behavior with quantitative analysis of those identified configurations, developing a matrix of sub-scale models and test conditions to fully characterize the dynamic response of each configuration, and executing stability tests through the use of a ballistic range test facility. The data acquired from the tests will provide crucial insight moving forward regarding the feasibility and relative stability of each of the configurations and guide further development of rigid deployable aerodynamic decelerators. This proposed research lies directly in line with the call laid out in the technology roadmap for new technologies which aid in aerobraking, aerocapture, and entry of spacecraft. The potential of rigid deployable decelerators and other similar technologies to enable ground breaking advancements in the capability of our nation to explore hinges on the continuous efforts of researches to further understand their behavior. Stability characterization is just one piece of that effort, but is a step that is necessary to increase the technology readiness of the next generation aerodynamic decelerators which will allow for humans to step foot on Mars.

## Anticipated Benefits

Rigid deployable aerodynamic decelerators would allow for bridging of the gap between the robotic missions which we have successfully landed on Mars to date and the potential human class missions. The potential of rigid deployable decelerators and other similar technologies to enable ground breaking advancements in the capability of our nation to explore hinges on the continuous efforts of researches to further understand their behavior. Stability characterization is just one piece of that effort, but is a step that is necessary to increase the technology readiness of the next generation aerodynamic decelerators which will allow for humans to step foot on Mars.



Project Image Dynamic Stability Characterization of Rigid Deployable Aerodynamic Decelerators

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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Responsible Program:

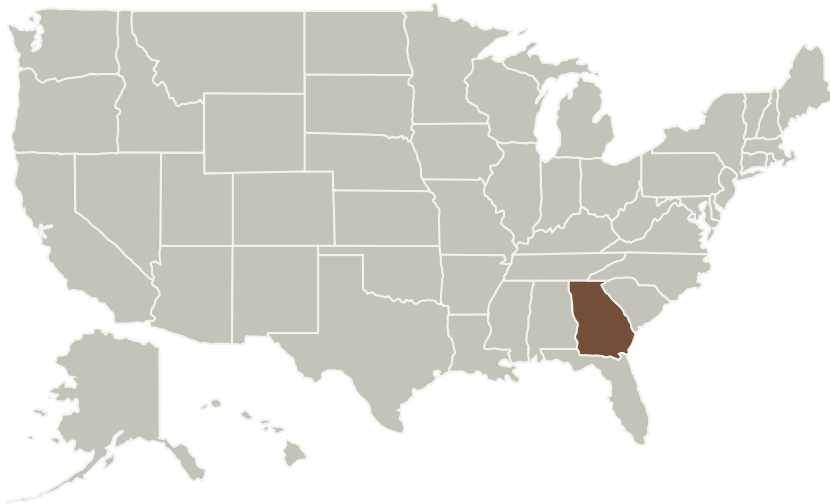
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Georgia Institute of Technology-Main Campus(GA Tech)	Supporting Organization	Academia	Atlanta, Georgia

## Primary U.S. Work Locations

Georgia

## Project Management

**Program Director:**

Claudia M Meyer

**Program Manager:**

Hung D Nguyen

**Principal Investigator:**

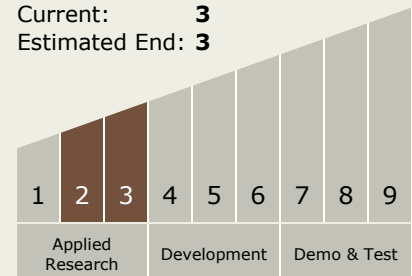
Robert D Braun

**Co-Investigator:**

Cole D Kazemba

## Technology Maturity (TRL)

Start: 2  
Current: 3  
Estimated End: 3



## Technology Areas

**Primary:**

- TX09 Entry, Descent, and Landing
  - TX09.2 Descent
    - TX09.2.1 Aerodynamic Decelerators

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## Images



**4329-1363269062944.jpg**

Project Image Dynamic Stability  
Characterization of Rigid  
Deployable Aerodynamic  
Decelerators

(<https://techport.nasa.gov/image/1845>)

## Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>